CLAIMS

We claim the following:

1. A method of stimulating the production of hematopoietic cells in a patient comprising the step of administering a polypeptide to the patient wherein the polypeptide is a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1}).

2. A method of stimulating the production of hematopoietic cells in a patient comprising the step of administering a composition to the patient wherein the composition comprises a pharmaceutically acceptable carrier and a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1}).

3. A method for selective ex vivo expansion of stem cells comprising the steps of:

(a) separating hematopoietic cells from other cells;

(b) culturing the separated hematopoietic cells in a culture medium comprising a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1}); and

(c) harvesting the cultured cells.

4. A method for selective ex vivo expansion of hematopoietic cells comprising the steps of:

(a) culturing the hematopoietic cells in a culture medium comprising a composition including a pharmaceutically acceptable carrier and a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising the residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1}); and

(b) harvesting the cultured cells.

5. A method for selective ex vivo expansion of hematopoietic cells comprising the steps of:

(a) separating hematopoietic cells from other cells;

(b) culturing the separated hematopoietic cells in a culture medium comprising a composition including a pharmaceutically acceptable carrier and a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1}); and

(c) harvesting the cultured cells.

6. A method for treatment of a patient having a hematopoietic disorder comprising the steps of:

(a) removing hematopoietic cells from the patient;

(b) culturing the separated hematopoietic cells in a culture medium comprising a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1});

(c) harvesting the cultured cells; and

(d) transplanting the cultured cells into the patient.

7. A method for treatment of a patient having a hematopoietic disorder comprising the steps of:

(a) removing hematopoietic cells from the patient;

(b) separating the hematopoietic cells from other cells;

(c) culturing the separated hematopoietic cells in a culture medium comprising a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1});

(d) harvesting the cultured cells; and

(e) transplanting the cultured cells into the patient.

8. A method for treatment of a patient having a hematopoietic disorder, comprising the steps of:

(a) removing hematopoietic cells from the patient;

(b) culturing the hematopoietic cells in a growth medium comprising a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1});

(c) harvesting the cultured cells; and

(d) transplanting the cultured cells into the patient.

9. A method for treatment of a patient having a hematopoietic disorder, comprising the steps of:

(a) removing hematopoietic cells from the patient;

(b) separating hematopoietic cells from other cells;

(c) culturing the separated hematopoietic cells in a growth medium comprising a composition including a pharmaceutically acceptable carrier and a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1});

(d) harvesting the cultured cells; and

(e) transplanting the cultured cells into the patient.

10. A method of human gene therapy comprising the steps of:

(a) removing hematopoietic cells from a patient;

(b) culturing the hematopoietic cells in a growth medium comprising a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1});

(c) transducing the cultured cells with DNA;

(d) harvesting the transduced cells; and

(e) transplanting the transduced cells into the patient.

11. A method of human gene therapy comprising the steps of:

(a) removing hematopoietic cells from a patient;

(b) separating the hematopoietic cells from other cells;

(c) culturing the separated hematopoietic cells in a growth medium comprising a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1});

(d) transducing the cultured cells with DNA;

(e) harvesting the transduced cells; and

(f) transplanting the transduced cells into the patient.

12. A method of human gene therapy comprising the steps of:

(a) removing hematopoietic cells from a patient;

(b) separating the hematopoietic cells from other cells;

(c) culturing the separated hematopoietic cells in a growth medium comprising a composition including a pharmaceutically acceptable carrier and a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1});

(d) transducing the cultured cells with DNA;

(e) harvesting the transduced cells; and

(f) transplanting the transduced cells into the patient.

13. A method of human gene therapy comprising the steps of:

(a) removing hematopoietic cells from a patient;

(b) separating the hematopoietic cells from other cells;

(c) culturing the separated hematopoietic cells in a growth medium comprising a composition including a pharmaceutically acceptable carrier and a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1});

(d) transducing the cultured cells with DNA;

(e) harvesting the transduced cells; and

(f) transplanting the transduced cells into the patient.

14. A method for the production of dendritic cells comprising the steps of:

(a) separating hematopoietic progenitor cells or CD34+ cells from other cells; and

(b) culturing the hematopoietic progenitor cells or CD34+ cells in a growth medium comprising a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1}).

15. The method of claim 14 further comprising the step of pulsing the culturing hematopoietic progenitor cells or CD34+ cells with an antigen.

16. The method of claim 14 wherein the growth medium further comprises one or more factors selected from the group consisting of: GM-CSF, IL-4, TNF-α, stem cell factor (SCF), flt-3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein, and a multi-functional receptor agonist.

17. The method of claim 15 wherein the growth medium further comprises one or more factors selected from the group consisting of: GM-CSF, IL-4, TNF-α, stem cell factor (SCF), flt-3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein, and a multi-functional receptor agonist.

18. A method for treating a human having a tumor, infection or auto-immune disease comprising the step of administering a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1}) to the human.

19. The method of claim 18 further comprising administrating one or more factors selected from the group consisting of: GM-CSF, IL-4, TNF-α, stem cell factor (SCF), flt-3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein, and a multi-functional receptor agonist.

20. The method of claim 18 further comprising the step of administering an antigen to the patient.

21. The method of claim 19 further comprising the step of administering an antigen to the patient.

22. A method for treating a human having a tumor, infection or auto-immune disease, comprising the steps of:

(a) mobilizing dendritic cell progenitors or mature dendritic cells by administering a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1}) to the human;

(b) removing the dendritic cell precursors or mature dendritic cells by a blood draw or pheresis;

(c) pulsing the dendritic cell precursors or mature dendritic cells with an antigen; and

(d) returning the antigen pulsed dendritic cell precursors or mature dendritic cells to the human.

23. The method of claim 22 further comprising administering in step (a) one or more factors selected from the group consisting of: GM-CSF, IL-4, TNF-α, stem cell factor (SCF), flt-3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein, and a multi-functional receptor agonist.

24. The method of claim 22 further comprising the step of culturing said dendritic cell precursors or mature dendritic cells from step (b) in a growth medium comprising the human flt-3 receptor agonist polypeptide.

25. The method of claim 23 further comprising the step of culturing the dendritic cell precursors or mature dendritic cells from step (b) in a growth medium comprising the human flt-3 receptor agonist polypeptide.

26. The method of claim 24 wherein the growth medium further comprises one or more factors selected from the group consisting of: GM-CSF, IL-4, TNF-α, stem cell factor (SCF), flt-3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein, and a multi-functional receptor agonist.

27. The method of claim 25 wherein the growth medium further comprises one or more factors selected from the group consisting of: GM-CSF, IL-4, TNF-α, stem cell factor (SCF), flt-3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein, and a multi-functional receptor agonist.

28. A method for treating a human having a tumor, infection or auto-immune disease comprising the steps of:

(a) removing hematopoietic progenitor cells or CD34+ cells from the human by a blood draw or pheresis;

(b) culturing the hematopoietic progenitor cells or CD34+ cells in a growth medium comprising a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1}) to produce dendritic cell precursors or mature dendritic cells; and

(c) returning the dendritic cell precursors or mature dendritic cells to the human.

29. A method for treating a human having a tumor, infection or auto-immune disease comprising the steps of:

(a) removing hematopoietic progenitor cells or CD34+ cells from the patient by a blood draw or pheresis;

(b) culturing the hematopoietic progenitor cells or CD34+ cells in a growth medium comprising a human flt-3 receptor agonist polypeptide comprising a modified flt-3 ligand amino acid sequence selected from the group consisting of:

(i) the sequence of SEQ ID NO: 144; and

(ii) a polypeptide comprising residues 1-132 of SEQ ID NO:144;

wherein the modification comprises the linear rearrangement of the sequences of (i) or (ii); wherein the N-terminus is joined to the C-terminus directly or through a linker capable of joining the N-terminus to the C-terminus and new C- and N-termini are created between the amino acid residue pairs of SEQ ID NO:144 selected from the group consisting of:

28-29, 29-30, 30-31, 31-32, 32-33, 34-35, 36-37, 37-38, 38-39, 40-41, 41-42, 42-43, 64-65, 65-66, 66-67, 86-87, 87-88, 88-89, 89-90, 90-91, 91-92, 92-93, 93-94, 94-95, 95-96, 96-97, 97-98, 98-99, 99-100, 100-101, 101-102, and 102-103; and

wherein optionally the flt-3 receptor agonist polypeptide is immediately preceded by (methionine^{-1}), (alanine^{-1}) or (methionine^{-2}, alanine^{-1}) to produce dendritic cell precursors or mature dendritic cells;

(c) pulsing the dendritic cell precursors or mature dendritic cells with an antigen; and

(d) returning the antigen pulsed dendritic cell precursors or mature dendritic cells to the human.

30. The method of claim 28 further comprising the step of separating the hematopoietic progenitor cells or CD34+ cells from other cells prior to culturing.

31. The method of claim 29 further comprising the step of separating the hematopoietic progenitor cells or CD34+ cells from other cells prior to culturing.

32. The method of claim 28 wherein the culture medium further comprises one or more factors selected from the group consisting of: GM-CSF, IL-4, TNF-α, stem cell factor (SCF), flt-3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein, and a multi-functional receptor agonist.

33. The method of claim 29 wherein the culture medium further comprises one or more factors selected from the group consisting of: GM-CSF, IL-4, TNF-α, stem cell factor (SCF), flt-3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein, and a multi-functional receptor agonist.

34. The method of claim 30 wherein the culture medium further comprises one or more factors selected from the group consisting of: GM-CSF, IL-4, TNF-α, stem cell factor (SCF), flt-3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein, and a multi-functional receptor agonist.

35. The method of claim 31 wherein the culture medium further comprises one or more factors selected from the group consisting of: GM-CSF, IL-4, TNF-α, stem cell factor (SCF), flt-3 ligand, IL-3, an IL-3 variant, an IL-3 variant fusion protein, and a multi-functional receptor agonist.